# Water Quality Assessment
# the North Fork of the Gunnison River
# Town of Paonia WWTF

# I. Water Quality Assessment Summary

Table A-1 includes summary information related to this Water Quality Assessment (WQA). This summary table includes key regulatory starting points used in development of the WQA such as: receiving stream information; threatened and endangered species; 303(d) and Monitoring and Evaluation listings; low flow and facility flow summaries; and a list of parameters evaluated.

**Table A-1**
**WQA Summary**

| **Facility Information** | | | |
|---|---|---|---|
| **Facility Name** | **Permit Number** | **Design Flow (max 30-day ave, MGD)** | **Design Flow (max 30-day ave, CFS)** |
| F1. Town of Paonia WWTF | CO0047431 | 0.495<br>0.3<br>0.2 | 0.77 (001C)<br>0.46 (001B)<br>0.31 (001A) |
| F2. Town of Hotchkiss WWTF | CO0044903 | 0.494 | 0.76 |

| **Receiving Stream Information** | | | |
|---|---|---|---|
| **Receiving Stream Name** | **Segment ID** | **Designation** | **Classification(s)** |
| S1. the North Fork of the Gunnison River | COGUNF03 | Undesignated | Aquatic Life Cold 1<br>Recreation P (October 1 to March 31)<br>Recreation E (April 1 to September 30)<br>Agriculture<br>Water Supply |

| **Low Flows (cfs)** | | | |
|---|---|---|---|
| **1E3 (1-day)** | **7E3 (7-day)** | **30E3 (30-day)** | **Ratio of 30E3 to the Design Flow (cfs)** |
| S1. 4.9 | 6.2 | 7.8 | F1: 10:1 |

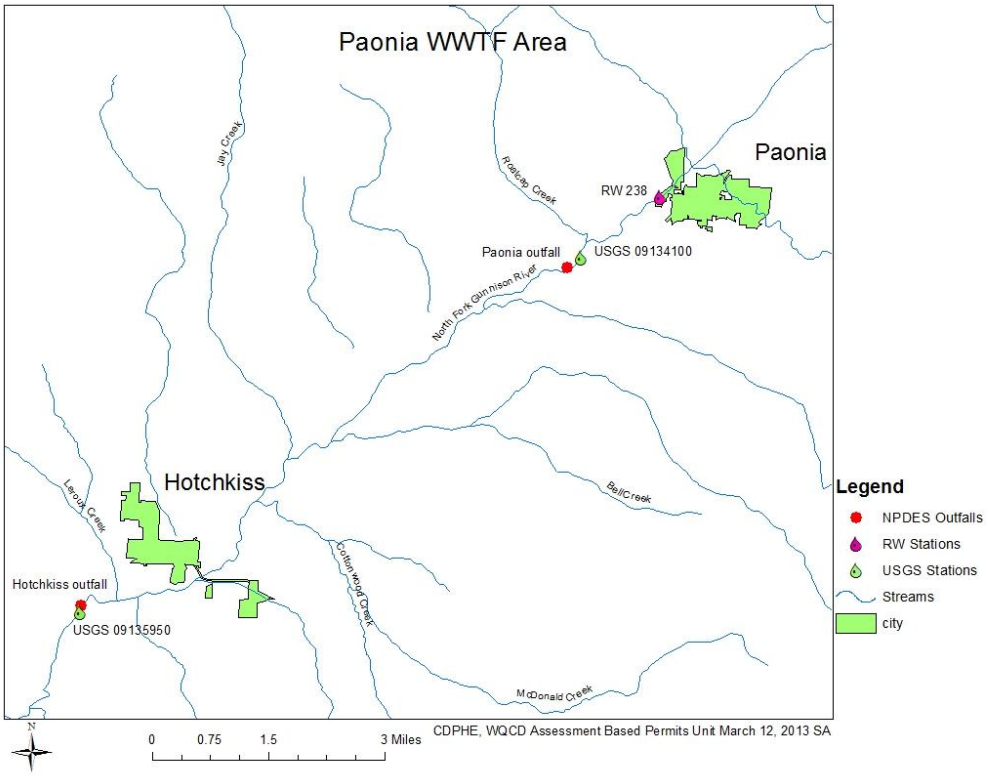
| **Regulatory Information** | | | | | |
|---|---|---|---|---|---|
| **T&E Species** | **303(d) (Reg 93)** | **Monitor and Eval (Reg 93)** | **Existing TMDL** | **Temporary Modification(s)** | **Control Regulation** |
| No | None currently | None currently | Yes<br>Feb. 14, 2011 Se | No | Regulation 39 |

| **Pollutants Evaluated** |
|---|
| F1: Ammonia, *E. Coli*, TRC, Se, Temp, Nitrate; F2: Ammonia |

# II. Introduction

The WQA of the North Fork of the Gunnison River near the Town of Paonia Waste Water Treatment Facilitiy (WWTF), located in Delta County, is intended to determine the assimilative capacities available for pollutants found to be of concern. This WQA describes how the water quality based effluent limits (WQBELs) are developed. These parameters may or may not appear in the permit with limitations or monitoring requirements, subject to other determinations such as reasonable potential analysis, evaluation of federal effluent limitation guidelines, implementation of state-based technology based limits, mixing zone analyses, 303(d) listings, threatened and endangered species listing, or other requirements as discussed in the permit rationale. Figure A-1 contains a map of the study area evaluated as part of this WQA.

**FIGURE A-1**



The WWTF discharges to the North Fork of the Gunnison River, which is stream segment COGUNF03. This means the Gunnison River Basin, North Fork of Gunnison River Sub-basin, Stream Segment 03. This segment is composed of the "Mainstem of North Fork of the Gunnison River from the Black Bridge (41.75 Drive) above Paonia to the confluence with the Gunnison River." Stream segment COGUNF03 is classified for Aquatic Life Cold 1, Recreation P (October 1 to March 31), Recreation E (April 1 to September 30), Water Supply and Agriculture.

This segment was included on the 2008 Colorado 303(d) List of Impaired Waters for Selenium (Se) requiring development of a Total Maximum Daily Load (TMDL) for Se. A TMDL was submitted and approved by the U.S. Environmental Protection Agency (EPA) on February 14, 2011.

Information used in this assessment includes data gathered from the Paonia WWTF, the Colorado Water Quality Control Division (Division), the Colorado Division of Water Resources (DWR), Riverwatch, the U.S. Geological Survey (USGS), and communications with the local water commissioner. The data used in the assessment consist of the best information available at the time of preparation of this WQA analysis.

## III. Water Quality Standards

**Narrative Standards**

Narrative Statewide Basic Standards have been developed in Section 31.11(1) of the regulations, and apply to any pollutant of concern, even where there is no numeric standard for that pollutant. Waters of the state shall be free from substances attributable to human-caused point source or nonpoint source discharges in amounts, concentrations or combinations which:

for all surface waters except wetlands;

(i) can settle to form bottom deposits detrimental to the beneficial uses. Depositions are stream bottom buildup of materials which include but are not limited to anaerobic sludge, mine slurry or tailings, silt, or mud; or (ii) form floating debris, scum, or other surface materials sufficient to harm existing beneficial uses; or (iii) produce color, odor, or other conditions in such a degree as to create a nuisance or harm existing beneficial uses or impart any undesirable taste to significant edible aquatic species or to the water; or (iv) are harmful to the beneficial uses or toxic to humans, animals, plants, or aquatic life; or (v) produce a predominance of undesirable aquatic life; or (vi) cause a film on the surface or produce a deposit on shorelines; and

for surface waters in wetlands;

(i) produce color, odor, changes in pH, or other conditions in such a degree as to create a nuisance or harm water quality dependent functions or impart any undesirable taste to significant edible aquatic species of the wetland; or (ii) are toxic to humans, animals, plants, or aquatic life of the wetland.

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for any parameter of concern could be put in Colorado Discharge Permit System (CDPS) discharge permits.

**Standards for Organic Parameters and Radionuclides**

**Radionuclides:** Statewide Basic Standards have been developed in Section 31.11(2) and (3) of The Basic Standards and Methodologies for Surface Water to protect the waters of the state from radionuclides and organic chemicals.

In no case shall radioactive materials in surface waters be increased by any cause attributable to municipal, industrial, or agricultural practices or discharges to as to exceed the following levels, unless alternative site-specific standards have been adopted. Standards for radionuclides are shown in Table A-2.

**Table A-2**
**Radionuclide Standards**

| Parameter | Picocuries per Liter |
|---|---|
| Americium 241* | 0.15 |
| Cesium 134 | 80 |
| Plutonium 239, and 240* | 0.15 |
| Radium 226 and 228* | 5 |
| Strontium 90* | 8 |
| Thorium 230 and 232* | 60 |
| Tritium | 20,000 |

*Radionuclide samples for these materials should be analyzed using unfiltered (total) samples. These Human Health based standards are 30-day average values for both plutonium and americium.

**Organics:** The organic pollutant standards contained in the Basic Standards for Organic Chemicals Table are applicable to all surface waters of the state for the corresponding use classifications, unless alternative site-specific standards have been adopted. These standards have been adopted as "interim standards" and will remain in effect until alternative permanent standards are adopted by the Colorado Water Quality Control Commission (Commission). These interim standards shall not be considered final or permanent standards subject to antibacksliding or downgrading restrictions. Although not reproduced in this WQA, the specific standards for organic chemicals can be found in Regulation 31.11(3).

In order to protect the Basic Standards in waters of the state, effluent limitations and/or monitoring requirements for radionuclides, organics, or any other parameter of concern could be put in CDPS discharge permits.

The aquatic life standards for organics apply to all stream segments that are classified for aquatic life. The water supply standards apply only to those segments that are classified for water supply. The water + fish standards apply to those segments that have a Class 1 aquatic life and a water supply classification. The fish ingestion standards apply to Class 1 aquatic life segments that do not have a water supply designation. The water + fish and the fish ingestion standards may also apply to Class 2 aquatic life segments, where the Commission has made such determination.

Because the the North Fork of the Gunnison River is classified for Aquatic Life Cold 1, with a water supply designation, the water + fish and aquatic life standards apply to this discharge.

**Temperature**

Temperature shall maintain a normal pattern of diurnal and seasonal fluctuations with no abrupt changes and shall have no increase in temperature of a magnitude, rate, and duration deemed deleterious to the resident aquatic life. This standard shall not be interpreted or applied in a manner inconsistent with section 25-8-104, C.R.S.

**Segment Specific Numeric Standards**

Numeric standards are developed on a basin-specific basis and are adopted for particular stream segments by the Commission. The standards in Table A-3 have been assigned to stream segment COGUNF03 in accordance with the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*.

The Commission has recently completed a preliminary final action concerning the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*. The recent changes that become effective March 31, 2013 will change the applicable standards for stream segment COGUNF03. These changes include seasonal recreation classifications and standards of Recreation E or 'existing recreation' from April 1 to September 30 with an associated standard of 126/100ml, and Recreation P or 'potential recreation' from October 1 to March 31 with a standard of 205/100ml. Additional changes included the addition of the Water Supply classification and associated standards, the addition of a numeric temperature standard, and the deletion of the Se temporary modification due to expire on March 31, 2013.

This WQA has been developed in conformance with the water quality standards that will become effective on March 31, 2013, as any permitting action based on this WQA would take effect immediately after (or just prior) to the effective date of this regulation.

**Table A-3**

**In-stream Standards for Stream Segment COGUNF03**

| |
|---|
| ***Physical and Biological*** |
| Dissolved Oxygen (DO) = 6 mg/l, minimum (7 mg/l, minimum during spawning) |
| pH = 6.5 - 9 su |
| *E. coli* chronic = 126 colonies/100 ml (April 1 to Sep 30); 630 colonies/100 ml (Oct 1 to Mar 31) |
| Temperature April-Oct =18.3° C MWAT and 23.9° C DM |
| Temperature Nov-March = 9° C MWAT and 13° C DM |
| ***Inorganic*** |
| Total Ammonia acute and chronic = TVS |
| Chlorine acute = 0.019 mg/l |
| Chlorine chronic = 0.011 mg/l |
| Free Cyanide acute = 0.005 mg/l |
| Sulfide chronic = 0.002 mg/l |
| Boron chronic = 0.75 mg/l |
| Nitrite acute = 0.05 mg/l |
| Nitrate acute = 10 mg/l |
| Chloride chronic = 250 mg/l |
| Sulfate chronic = For WS, the greater of ambient water quality as of January 1, 2000 or 250 mg/l |
| ***Metals*** |
| Dissolved Arsenic acute = 340 µg/l |
| Total Recoverable Arsenic chronic = 0.02 µg/l |
| Dissolved Cadmium acute for trout and Dissolved Cadmium chronic = TVS |
| Total Recoverable Trivalent Chromium acute = 50 µg/l |
| Dissolved Trivalent Chromium chronic = TVS |
| Dissolved Hexavalent Chromium acute and chronic = TVS |
| Dissolved Copper acute and chronic = TVS |
| Dissolved Iron chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 300 µg/l |
| Total Recoverable Iron chronic = 1000 µg/l |
| Dissolved Lead acute and chronic = TVS |
| Dissolved Manganese chronic = For WS, the greater of ambient water quality as of January 1, 2000, or 50 µg/l |
| Dissolved Manganese acute and chronic = TVS |
| Total Recoverable Molybdenum chronic = 160 µg/l |
| Total Mercury chronic = 0.01 µg/l |
| Dissolved Nickel acute and chronic = TVS |
| Dissolved Selenium acute and chronic = TVS |
| Dissolved Silver acute and Dissolved Silver chronic for trout = TVS |
| Dissolved Zinc acute and chronic = TVS |

**Table Value Standards and Hardness Calculations**

Standards for metals are generally shown in the regulations as Table Value Standards (TVS), and these often must be derived from equations that depend on the receiving stream hardness or species of fish present; for ammonia, standards are discussed further in Section IV of this WQA. The Classification and Numeric Standards documents for each basin include a specification for appropriate hardness values to be used. Specifically, the regulations state that:

> The hardness values used in calculating the appropriate metal standard should be based on the lower 95% confidence limit of the mean hardness value at the periodic low flow criteria as determined from a regression analysis of site-specific data. Where insufficient site-specific data exists to define the mean hardness value at the periodic low flow criteria, representative regional data shall be used to perform the regression analysis. Where a regression analysis is not appropriate, a site-specific method should be used.

Metals with standards specified as TVS are not included as parameters of concern for this facility. Only metal that the Division will look into is Se due to the wasteload allocation (WLA) included in the Gunnison Se TMDL. It should be noted that selenium standards (4.6 µg/l (ch) and 18.4 µg/l (ac)) are not specified as TVS; therefore, no TVS table will be included in this WQA.

**Total Maximum Daily Loads and Regulation 93 – Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List**

This stream segment is not currently listed on the Division's 303(d) list of water quality impacted streams and is not on the monitoring and evaluation list. It was delisted in 2012 for the submitted and approved Gunnison Selenium TMDL.

The Division's Restoration and Protection Unit completed the TMDL in 2011 and therefore the requirements of this TMDL apply for Se. For this permit, the TMDL states that the total WLA for the segment is 0.32 lbs/d based on an individual WLA for Paonia of 0.17 lbs/d. The development of the Paonia WLA was based on a concentration limit of 42 µg/L set to protect the water quality standard at the design flow level.

## IV. Receiving Stream Information

**Low Flow Analysis**

The Colorado Regulations specify the use of low flow conditions when establishing water quality based effluent limitations, specifically the acute and chronic low flows. The acute low flow, referred to as 1E3, represents the one-day low flow recurring in a three-year interval, and is used in developing limitations based on an acute standard. The 7-day average low flow, 7E3, represents the seven-day average low flow recurring in a 3 year interval, and is used in developing limitations based on a Maximum Weekly Average Temperature standard (MWAT). The chronic low flow, 30E3, represents the 30-day average low flow recurring in a three-year interval, and is used in developing limitations based on a chronic standard.

To determine the low flows available to the Paonia WWTF, USGS gage station 09134100 (North Fork Gunnison River below Paonia, CO) was used. The gage was installed in March 2000 just upstream of the Paonia WWTF. This flow gage provides a representative measurement of upstream flow because it is located immediately upstream of the WWTF.

Daily flows from the USGS Gage Station 09134100 (North Fork Gunnison River below Paonia, CO) were obtained and the annual 1E3 and 30E3 low flows were calculated using EPA DFLOW software. The output from DFLOW provides calculated acute and chronic low flows for each month.

Flow data from March 7, 2000 through October 12, 2012 were available from the gage station. The most recent ten years of data, 2002 to 2012 were deemed the most accurate and representative of current flows and were therefore used in this analysis.

Based on the low flow analysis described previously, the upstream low flows available to the Paonia WWTF were calculated and are presented in Table A-4.

**Table A-4**

**Low Flows for the North Fork of the Gunnison River at the Paonia WWTF**

| *Low Flow (cfs)* | *Annual* | *Jan* | *Feb* | *Mar* | *Apr* | *May* | *Jun* | *Jul* | *Aug* | *Sep* | *Oct* | *Nov* | *Dec* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1E3 Acute | 4.9 | 40 | 36 | 43 | 68 | 16 | 7.1 | 4.9 | 5.1 | 4.9 | 5.1 | 34 | 29 |
| 7E3 Chronic | 6.2 | 42 | 40 | 45 | 102 | 16 | 7.8 | 6.2 | 6.5 | 6.2 | 6.4 | 34 | 40 |
| 30E3 Chronic | 7.8 | 43 | 43 | 45 | 102 | 16 | 7.8 | 7.8 | 7.8 | 7.8 | 7.8 | 34 | 45 |

During the months of May and November, the acute low flow calculated by DFLOW exceeded the chronic low flow. In accordance with Division standard procedures, the acute low flow was thus set equal to the chronic low flow for these months.

Likewise during the months of March, April, May, June and November, the 7E3 low flow exceeded the calculated chronic low flow. The 7E3 was therefore set equal to the chronic low flow for those months.

The ratio of the low flow of the North Fork of the Gunnison River to the Paonia WWTF design flow is 10:1 (001C); and at the tiered flows 17:1 (001B) and 25:1 (001A).

## Mixing Zones

The amount of the available assimilative capacity (dilution) that may be used by the permittee for the purposes of calculating the WQBELs may be limited in a permitting action based upon a mixing zone analysis or other factor.

These other factors that may reduce the amount of assimilative capacity available in a permit are: presence of other dischargers in the vicinity; the presence of a water diversion downstream of the discharge (in the mixing zone); the need to provide a zone of passage for aquatic life; the likelihood of bioaccumulation of toxins in fish or wildlife; habitat considerations such as fish spawning or nursery areas; the presence of threatened and endangered species; potential for human exposure through drinking water or recreation; the possibility that aquatic life will be attracted to the effluent plume; the potential for adverse effects on groundwater; and the toxicity or persistence of the substance discharged.

Unless a facility has performed a mixing zone study during the course of the previous permit, and a decision has been made regarding the amount of the assimilative capacity that can be used by the facility, the Division assumes that the full assimilative capacity can be allocated. Note that the review of mixing study considerations, exemptions and perhaps performing a new mixing study (due to changes in low flow, change in facility design flow, channel geomorphology or other reason) is evaluated in every permit and permit renewal.

If a mixing zone study has been performed and a decision regarding the amount of available assimilative capacity has been made, the Division may calculate the WQBELs based on this available capacity. In addition, the amount of assimilative capacity may be reduced by threatened and endangered species (T&E) implications.

For this facility, 100% of the available assimilative capacity may be used as Paonia previously demonstrated in 2008 that they were excluded from further reduction in available assimilative capacity based on mixing zones due to exclusions based on ratios of river dimensions. The Division has determined that major changes have not occurred since 2008 and therefore the results of that study remain valid for the current permit renewal. The discharge is not to a T&E stream segment, and is not expected to have an influence on any of the other factors listed above.

**Ambient Water Quality**

The Division evaluates ambient water quality based on a variety of statistical methods as prescribed in Section 31.8(2)(a)(i) and 31.8(2)(b)(i)(B) of the *Colorado Department of Public Health and Environment Water Quality Control Commission Regulation No. 31*, and as outlined in the Division's Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits (WQP-19). Ambient water quality is evaluated in this WQA analysis for use in determining assimilative capacities and in completing antidegradation reviews for pollutants of concern, where applicable.

To conduct an assessment of the ambient water quality upstream of the Paonia WWTF, data were gathered primarily from Riverwatch Station 238 located approximately 1.5 miles upstream from the facility. Data were available for a period of record from November 8, 2000 through April 24, 2012. The most recent five years of data were then used from April 11, 2007 through April 24, 2012. These data are summarized in Table A-5.

**Table A-5**

**Ambient Water Quality for the North Fork of the Gunnison River**

| *Parameter* | *Number of Samples* | *15th Percentile* | *50th Percentile* | *85th Percentile* | *Mean* | *Maximum* | *Chronic Stream Standard* | *Notes* |
|---|---|---|---|---|---|---|---|---|
| Temp (°C) | 19 | 1 | 6 | 14 | 6.4 | 18 | NA | |
| DO (mg/l) | 19 | 8.5 | 10 | 11 | 10 | 13 | 7 | |
| pH (su) | 16 | 7.8 | 8.2 | 8.3 | 8.1 | 8.4 | 6.5-9 | |
| *E. coli* (#/100 ml) | 1 | 36 | 36 | 36 | 36 | 36 | 126 | 1 |
| TRC (mg/l) | 0 | 0 | 0 | 0 | 0 | 0 | 0.011 | 3 |
| Nitrate as N (mg/l) | 0 | 0 | 0 | 0 | 0 | 0 | 10 | 3 |
| Nitrite as N (mg/l) | 0 | 0 | 0 | 0 | 0 | 0 | 0.05 | 3 |
| Nitrate+Nitrite as N (mg/l) | 14 | 0.0095 | 0.056 | 0.074 | 0.053 | 0.14 | NA | |
| Total Inorganic Nitrogen (mg/l) | 14 | 0.0095 | 0.061 | 0.15 | 0.078 | 0.28 | NA | |
| $NH_3$ as N, Tot (mg/l) | 14 | 0 | 0 | 0.042 | 0.025 | 0.21 | TVS | 2 |
| NH3 as N, Tot (mg/l) Jan | 1 | 0.01 | 0.01 | 0.01 | 0.01 | 0 | TVS | |
| NH3 as N, Tot (mg/l) Feb | 0 | 0 | 0 | 0 | 0 | 0 | TVS | 3 |
| NH3 as N, Tot (mg/l) Mar | 1 | 0.21 | 0.21 | 0.21 | 0.21 | 0 | TVS | |
| NH3 as N, Tot (mg/l) Apr | 3 | 0.003 | 0.01 | 0.059 | 0.03 | 0 | TVS | |
| NH3 as N, Tot (mg/l) May | 2 | 0.006 | 0.02 | 0.034 | 0.02 | 0 | TVS | |
| NH3 as N, Tot (mg/l) Jun | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| NH3 as N, Tot (mg/l) Jul | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| NH3 as N, Tot (mg/l) Aug | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| NH3 as N, Tot (mg/l) Sep | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| NH3 as N, Tot (mg/l) Oct | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| NH3 as N, Tot (mg/l) Nov | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| NH3 as N, Tot (mg/l) Dec | 1 | 0 | 0 | 0 | 0 | 0 | TVS | 2 |
| TSS (mg/l) | 13 | 10 | 16 | 83 | 40 | 0 | NA | |
| Se, Dis (µg/l) | 19 | 0 | 0 | 0 | 0.62 | 12 | 4.6 | 2 |
| Sulfate (mg/l) | 13 | 18 | 34 | 72 | 55 | 216 | 250 | |
| Hardness as $CaCO_3$ (mg/l) | 17 | 73 | 118 | 194 | 130 | 324 | NA | |

Note 1: The calculated mean is the geometric mean. Note that for summarization purposes, the value of one was used where there was no detectable amount because the geometric mean cannot be calculated using a value equal to zero.

Note 2: When sample results were below detection levels, the value of zero was used in accordance with the Division's standard approach for summarization and averaging purposes.

Note 3: Data was unavailable for these parameters.

# V. Facility Information and Pollutants Evaluated

## Facility Information

The Paonia WWTF is located in the NW¼ of the NW¼ of S12, plus SW¼ of the SW¼ of S1, the S½ of the SE¼ of S2, and the NE¼ of S11, T14S, R92W; at 38976 Highway 133, in Paonia, CO; 38°51'20" latitude North and 107°37'30" longitude West in Delta County. The current design capacity of the facility is 0.495 MGD (0.77 cfs). The Paonia WWTF current permit includes tiered flows consisting of Outfall 001C, design capacity of 0.495 MGD (0.77cfs); Outfall 001B, 0.3 MGD (0.464 cfs) and Outfall 001A, 0.2 MGD (0.31 cfs). WQBELs were calculated in this WQA for all three tiers; however, not all tiers may be included in the final permit.

Wastewater treatment is accomplished using aerated lagoons. The technical analyses that follow include assessments of the assimilative capacity based on this design capacity.

An assessment of Division records indicate that there are several facilities discharging to the same stream segment or other stream segments immediately upstream or downstream from this facility. Several of these facilities are covered by general permits and have limitations set at the water quality standards. These facilities were not modeled in this WQA as they have a minimal impact on the ambient water quality.

Due to the distance between facilities, the ambient water quality background concentrations used in the mass-balance equation (as described in the following section) account for pollutants of concern contributed by upstream sources, and therefore it was not necessary to model upstream dischargers together with the Paonia WWTF when determining the available assimilative capacities in the North Fork of the Gunnison River.

In terms of downstream sources, the Town of Hotchkiss WWTF discharges to the North Fork of the Gunnison River approximately 7.8 miles downstream of the Paonia WWTF; therefore, modeling Hotchkiss in conjunction with the Paonia WWTF was necessary for ammonia.

## Pollutants of Concern

Pollutants of concern may be determined by one or more of the following: facility type; effluent characteristics and chemistry; effluent water quality data; receiving water quality; presence of federal effluent limitation guidelines; or other information. Parameters evaluated in this WQA may or may not appear in a permit with limitations or monitoring requirements, subject to other determinations such as a reasonable potential analysis, mixing zone analyses, 303(d) listings, threatened and endangered species listings or other requirement as discussed in a permit rationale.

There are no site-specific in-stream water quality standards for $BOD_5$ or $CBOD_5$, TSS, percent removal, and oil and grease for this receiving stream. Thus, assimilative capacities were not determined for these parameters. The applicable limitations for these pollutants can be found in Regulation No. 62 and will be applied in the permit for the WWTF.

The following parameters were identified by the Division as pollutants to be evaluated for this facility:

- Total Residual Chlorine
- *E. coli*
- Nitrate
- Ammonia
- Temperature
- Se

Based upon the size of the discharge, the lack of industrial contributors, dilution provided by the receiving stream and the fact that no unusually high metals concentrations are expected to be found in the wastewater effluent, metals besides Se are not evaluated further in this water quality assessment.

According to the *Rationale for Classifications, Standards and Designations of the Gunnison River*, stream segment COGUNF03 is designated a water supply because of the presence of six alluvial wells in close proximity to the North Fork of the Gunnison River. One of these wells is located within a half mile downstream of the facility. The well (Receipt number 0436638, Permit number 212934) for household use is located 150 feet from the North Fork of the Gunnison, is approximately 50 feet deep with the top of the screen at 20 feet. Thus, the nitrate standard, which is applied at the point of intake to a water supply, is further evaluated as part of this WQA.

During assessment of the facility, nearby facilities, and receiving stream water quality, no additional parameters were identified as pollutants of concern.

## VI. Determination of Water Quality Based Effluent Limitations (WQBELs)

**Technical Information**

Note that the WQBELs developed in the following paragraphs, are calculations of what an effluent limitation may be in a permit. The WQBELs for any given parameter, will be compared to other potential limitations (federal effluent limitations guidelines, state effluent limitations, or other applicable limitation) and typically the more stringent limit is incorporated into a permit. If the WQBEL is the more stringent limitation, incorporation into a permit is dependent upon a reasonable potential analysis.

In-stream background data and low flows evaluated in Sections III and IV are used to determine the assimilative capacity of the North Fork of the Gunnison River near the Paonia WWTF for pollutants of concern, and to calculate the WQBELs. For all parameters except ammonia, it is the Division's approach to calculate the WQBELs using the lowest of the monthly low flows (referred to as the annual low flow) as determined in the low flow analysis. For ammonia, it is the standard procedure of the Division to determine monthly WQBELs using the monthly low flows, as the regulations allow the use of seasonal flows.

The Division's standard analysis consists of steady-state, mass-balance calculations for most pollutants and modeling for pollutants such as ammonia. The mass-balance equation is used by the Division to calculate the WQBELs, and accounts for the upstream concentration of a pollutant at the existing quality, critical low flow (minimal dilution), effluent flow and the water quality standard. The mass-balance equation is expressed as:

$$M_2 = \frac{M_3 Q_3 - M_1 Q_1}{Q_2}$$

Where,

$Q_1$ = Upstream low flow (1E3 or 30E3)
$Q_2$ = Average daily effluent flow (design capacity)
$Q_3$ = Downstream flow ($Q_1 + Q_2$)
$M_1$ = In-stream background pollutant concentrations at the existing quality
$M_2$ = Calculated WQBEL
$M_3$ = Water Quality Standard, or other maximum allowable pollutant concentration

The upstream background pollutant concentrations used in the mass-balance equation will vary based on the regulatory definition of existing ambient water quality. For most pollutants, existing quality is determined to be the 85$^{th}$ percentile. For metals in the total or total recoverable form, existing quality is determined to be the 50$^{th}$ percentile. For pathogens such as fecal coliform and *E. coli*, existing quality is determined to be the geometric mean.

For temperature, the highest 7-day mean (for the chronic standard) of daily average stream temperature, over a seven consecutive day period will be used in calculations of the chronic temperature assimilative capacity, where the daily average temperature should be calculated from a minimum of three measurements spaced equally through the day. The highest 2-hour mean (for the acute standard) of stream temperature will be used in calculations of the acute temperature assimilative capacity. The highest 2-hour mean should be calculated from a minimum of 12 measurements spaced equally through the day.

**Calculation of WQBELs**

Using the mass-balance equation provided in the beginning of Section VI, the acute and chronic low flows set out in Section IV, ambient water quality as discussed in Section IV, and the in-stream standards shown in Section III, the WQBELs for were calculated. The data used and the resulting WQBELs, $M_2$, are set forth in Tables A-7a, b and c for the chronic WQBELs and A-8a,b and c for the acute WQBELs.

**Chlorine:** There are no point sources discharging total residual chlorine within one mile of the Paonia WWTF. Because chlorine is rapidly oxidized, in-stream levels of residual chlorine are detected only for a short distance below a source. Ambient chlorine was therefore assumed to be zero.

***E. coli*:** There are no point sources discharging E. coli within one mile of the Paonia WWTF. Thus, WQBELs were evaluated separately.

Due to the lack of current *E.coli* data (or fecal coliform data), the Division used the previous estimate of instream quality of 36 #/100ml from the preliminary effluent limit (PEL) development for the Paonia WWTF. For *E. coli*, the Division establishes the 7-day geometric mean limit as two times the 30-day geometric mean limit.

**Temperature:** Based on the Division's Temperature Policy, WQP-23, domestic WWTF with a ratio of the 7E3 annual low flow to the permitted flow of greater than 10:1 is excluded from temperature limitations. For Paonia, the current 001B and 001A permitted discharge flows of 0.3 MGD (0.464 cfs) and 0.2 MGD (0.31cfs), respectively are excluded when compared to the 7E3 low flow of 6.2 cfs. The 001C permitted design flow of 0.495 MGD (0.77 cfs) is not excluded since the ratio (8:1) is less than 10:1 and therefore a temperature limit needs to be evaluated further.

A WQBEL for temperature can only be calculated if there is representative data, in the proper form, to determine what the background Maximum Weekly Average Temperature and Daily Maximum ambient temperatures are. As this data is not available at this time, there will not be a temperature limitation for this permit cycle and only reporting will be required. This will be revisited in the future when representative temperature data becomes available.

**Nitrate / Total Inorganic Nitrogen (T.I.N.):** An acute nitrate standard of 10 mg/l is assigned to this segment, and is intended to be applied at the nearest downstream water intake, which is located within a half mile of the Paonia WWTF. Because nitrite and ammonia can also form nitrate, compliance with the nitrate standard is achieved through imposition of a Total Inorganic Nitrogen (T.I.N.) limit of 10 mg/l. T.I.N. effectively measures nitrate and its precursors including nitrite and ammonia.

The low flow values calculated from USGS Station 09134100 and ambient water quality from Riverwatch station 238 are the appropriate data sources for the T.I.N. analysis.

To determine the background concentration for T.I.N. for use in the mass balance equation, same day samples of the ambient data for ammonia, nitrite and nitrate (or nitrite + nitrate) were added together. The $85^{th}$ percentile of this summed data was calculated as 0.145 mg/L and used as the ambient water quality for T.I.N.

**Selenium:** The Gunnison Se TMDL contains a WLA for the Hotchkiss and Paonia WWTFs for chronic Se of 0.32 pounds per day (lbs/d). This allocation is the total of the WLA for Hotchkiss of 0.15 lbs/d and Paonia of 0.17 lbs/d. The facilities WLAs were calculated from WQBELs converted to loads by multiplying by the facilities' design flows. The development of the WQBEL is standard practice to ensure compliance with the Water Quality Standards (WQSs) in the receiving stream. The chronic Se WQBEL for Paonia was 42µg/L. WLAs are implemented in permits. The TMDL did not include an assessment for acute Se. In order to determine the reasonable potential for Se in the Hotchkiss WWTF effluent, sampling must be performed.

The currently calculated WQBEL for chronic Se at design capacity is 51 µg/L which is less stringent than the TMDL WLA of 42µg/L. The acute WQBEL for Se at design capacity is currently calculated as 135µg/L.

**Table A-6a**

**Chronic WQBELs at Design Flow of 0.495 MGD (0.77cfs) Outfall 001C**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ | *Notes* |
|---|---|---|---|---|---|---|---|
| *E.coli*, (#/100ml) Oct-Mar | 7.80 | 0.77 | 8.6 | 36 | 205 | ***1926*** | |
| *E.coli*, (#/100ml) Apr-Sep | 7.80 | 0.77 | 8.6 | 36 | 126 | ***1043*** | |
| TRC (mg/l) | 7.8 | 0.77 | 8.57 | 0 | 0.011 | ***0.12*** | |
| Se, Dis (µg/l) | NA | NA | NA | NA | NA | ***42**** | 1 |

Note 1: The Se WQBEL was determined during the Gunnison TMDL analysis to be 42 µg/L with a WLA of 0.17 lbs/day
*This is more stringent than the potential WQBEL of 51 µg/l and therefore it is applied. Not shown for other tiers since others are less stringent than 51 µg/l.

**Table A-6b**

**Chronic WQBELs at Tiered Flow of 0.3 MGD (0.464cfs) Outfall 001B**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ | *Notes* |
|---|---|---|---|---|---|---|---|
| *E.coli*, (#/100ml) Oct-Mar | 7.80 | 0.46 | 8.3 | 36 | 205 | ***3045*** | |
| *E.coli*, (#/100ml) Apr-Sep | 7.80 | 0.46 | 8.3 | 36 | 126 | ***1639*** | |
| TRC (mg/l) | 7.80 | 0.46 | 8.3 | 0 | 0.011 | ***0.196*** | |
| Se, Dis (µg/l) | NA | NA | NA | NA | NA | ***68*** | 1 |

Note 1: The Se WQBEL was determined during the Gunnison TMDL analysis to be 42 µg/L with a WLA of 0.17 lbs/day; however at this flow tier the WQBELwould be 68 µg/l.

**Table A-6c**

**Chronic WQBELs at Tiered Flow of 0.2 MGD (0.31cfs) Outfall 001A**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ | *Notes* |
|---|---|---|---|---|---|---|---|
| *E.coli*, (#/100ml) Oct-Mar | 7.80 | 0.31 | 8.1 | 36 | 205 | ***4466*** | |
| *E.coli*, (#/100ml) Apr-Sep | 7.80 | 0.31 | 8.1 | 36 | 126 | ***2395*** | |
| TRC (mg/l) | 7.80 | 0.31 | 8.1 | 0 | 0.011 | ***0.288*** | |
| Se, Dis (µg/l) | NA | NA | NA | NA | NA | ***102*** | 1 |

Note 1: The Se WQBEL was determined during the Gunnison TMDL analysis to be 42 µg/L with a WLA of 0.17 lbs/day; however at this flow tier the WQBELwould be 102 µg/l.

**Table A-7a**

**Acute WQBELs at Design Flow of 0.495 MGD (0.77cfs) Outfall 001C**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ | *Notes* |
|---|---|---|---|---|---|---|---|
| *E.coli*, (#/100ml) Oct-Mar | | | | | | ***3852*** | 1 |
| *E.coli*, (#/100ml) Apr-Sep | | | | | | ***2086*** | 1 |
| TRC (mg/l) | 4.9 | 0.77 | 5.67 | 0 | 0.019 | ***0.14*** | |
| Nitrate as N (mg/l) | 4.9 | 0.77 | 5.67 | 0 | 10 | ***NA*** | 3 |
| Nitrite as N (mg/l) | 4.9 | 0.77 | 5.67 | 0 | 0.05 | ***NA*** | 3 |
| Nitrate + Nitrite as N (mg/l) | 4.9 | 0.77 | 5.67 | 0.074 | NA | ***NA*** | 3 |
| Total Inorganic Nitrogen (mg/l) | 4.9 | 0.77 | 5.67 | 0.145 | 10 | ***73*** | 3 |
| Se, Dis (µg/l) | 4.9 | 0.77 | 5.67 | 0 | 18.4 | ***135*** | 2 |

Note: 1 The acute *E.coli* limit is calculated at 2 times the chronic limit.
2 The Gunnison Se TMDL analysis did not include acute WLAs. The current acute WQBEL at design capacity is provided here.
3 Compliance with the nitrate standard is achieved through the imposition of a T.I.N. limit of 10 mg/l. The other N parameters are provided at the design capacity for informational purposes.

**Table A-7b**

**Acute WQBELs at Tiered Flow of 0.3 MGD (0.464cfs) Outfall 001B**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ | *Notes* |
|---|---|---|---|---|---|---|---|
| *E.coli*, (#/100ml) Oct-Mar | | | | | | ***6090*** | 1 |
| *E.coli*, (#/100ml) Apr-Sep | | | | | | ***3278*** | 1 |
| TRC (mg/l) | 4.9 | 0.46 | 5.4 | 0 | 0.019 | ***0.220*** | |
| Total Inorganic Nitrogen (mg/l) | 4.9 | 0.46 | 5.4 | 0.145 | 10 | ***114*** | |

Note: 1 The acute *E.coli* limit is calculated at 2 times the chronic limit.

**Table A-7c**

**Acute WQBELs at Tiered Flow of 0.2 MGD (0.31cfs) Outfall 001A**

| *Parameter* | $Q_1$ (cfs) | $Q_2$ (cfs) | $Q_3$ (cfs) | $M_1$ | $M_3$ | $M_2$ | *Notes* |
|---|---|---|---|---|---|---|---|
| *E.coli*, (#/100ml) Oct-Mar | | | | | | ***8932*** | 1 |
| *E.coli*, (#/100ml) Apr-Sep | | | | | | ***4790*** | 1 |
| TRC (mg/l) | 4.9 | 0.31 | 5.2 | 0 | 0.019 | ***0.319*** | |
| Total Inorganic Nitrogen (mg/l) | 4.9 | 0.31 | 5.2 | 0.145 | 10 | ***166*** | |

Note: 1 The acute *E.coli* limit is calculated at 2 times the chronic limit.

**Ammonia:** The Ammonia Toxicity Model (AMMTOX) is a software program designed to project the downstream effects of ammonia and the ammonia assimilative capacities available to each discharger based on upstream water quality and effluent discharges.

To develop data for the AMMTOX model, an in-stream water quality study should be conducted of the upstream receiving water conditions, particularly the pH and corresponding temperature, over a period of at least one year.

Due to the close proximity of Paonia and Hotchkiss WWTFs (7.8 miles), the two facilities were modeled together for ammonia. Ammonia, temperature and corresponding pH data sets reflecting upstream ambient receiving water conditions were available for the North Fork of the Gunnison River based on data assessed from Riverwatch Station 238. The data, reflecting a period of record from April 2007 through April 2012, were used to establish the average headwater conditions in the AMMTOX model. Effluent pH data were also available from the Paonia and Hotchkiss DMRs and were used to establish the average facility contributions in the AMMTOX model. Effluent temperature data was not available; therefore, default temperature values for Paonia and Hotchkiss were taken from AMMTOX documentation files. Adequate downstream pH and temperature data were not available in order to calculate setpoint conditions; therefore, conservative assumptions of 9 pH and 20 degrees C were used.

The mean total ammonia concentration found in the North Fork of the Gunnison River as summarized in Table A-5 was used as an applicable upstream ammonia concentration reflective of each month.
The AMMTOX may be calibrated for a number of variables in addition to the data discussed above. The values used for the other variables in the model are listed below:

- Stream velocity = $0.3Q^{0.4d}$
- Default ammonia loss rate = 6/day
- pH amplitude was assumed to be medium
- Default times for pH maximum, temperature maximum, and time of day of occurrence
- pH rebound was set at the default value of 0.2 su per mile
- Temperature rebound was set at the default value of 0.7 degrees C per mile.

Consistent with the previous permit analysis (PEL development) and in order to better represent site conditions, the seepage rate in AMMTOX was set to 2.5 cfs/mile along with an ammonia concentration of 0.01 mg/L.

Ammonia assimilative capacities for the Paonia and Hotchkiss WWTFs were set equally for the analysis at the Paonia design capacity. The results included three months (February, June and July) when compliance with the new WQBELs for Paonia may be difficult. The Division therefore assessed ammonia assimilative capacities at Paonia's two existing additional flow tiers of 0.3 and 0.2 MGD. There are no predicted compliance issues with the calculated WQBELs at the additional flow tiers. The Division's analysis indicates the third flow tier of 0.2 MGD remains unnecessary for the new permit cycle. It should be noted, the Hotchkiss assimilative capacities were kept constant throughout the different analyses. The Hotchkiss WWTF is not foreseen to have any compliance issues with the ammonia assimilative capacities calculated.

The results of the ammonia analyses for the Paonia WWTF are presented in Tables A-9a, b and c for the three flow tiers consisting of: Outfall 001C, Design capacity of 0.495 MGD (0.77cfs); Outfall 001B, 0.3 MGD (0.464 cfs) and Outfall 001A, 0.2 MGD (0.31 cfs).

**Table A-8a**

**AMMTOX Results for the North Fork of the Gunnison River at the Paonia and Hotchkiss WWTFs**

***Design of 0.495 MGD (0.77cfs) Outfall 001C***

| *Month* | *Total Ammonia Chronic (mg/l)* | *Total Ammonia Acute (mg/l)* |
|---|---|---|
| **January** | 26 | 40 |
| **February** | 26 | 40 |
| **March** | 23 | 40 |
| **April** | 40 | 40 |
| **May** | 19 | 35 |
| **June** | 15 | 30 |
| **July** | 13 | 33 |
| **August** | 14 | 34 |
| **September** | 14 | 32 |
| **October** | 16 | 28 |
| **November** | 25 | 40 |
| **December** | 26 | 38 |

**Table A-8b**

**AMMTOX Results for the North Fork of the Gunnison River at the Paonia WWTF**

***Flow Tier of 0.3 MGD (0.464cfs) Outfall 001B***

| *Month* | *Total Ammonia Chronic (mg/l)* | *Total Ammonia Acute (mg/l)* |
|---|---|---|
| **January** | 40 | 90 |
| **February** | 40 | 75 |
| **March** | 40 | 90 |
| **April** | 90 | 175 |
| **May** | 32 | 55 |
| **June** | 30 | 55 |
| **July** | 27 | 45 |
| **August** | 30 | 50 |
| **September** | 21 | 50 |
| **October** | 33 | 50 |
| **November** | 40 | 95 |
| **December** | 40 | 60 |

**Table A-8c**

**AMMTOX Results for the North Fork of the Gunnison River at the Paonia WWTF**

***Flow Tier of 0.2 MGD (0.31cfs) Outfall 001A***

| *Month* | *Total Ammonia Chronic (mg/l)* | *Total Ammonia Acute (mg/l)* |
|---|---|---|
| **January** | 60 | 130 |
| **February** | 60 | 115 |
| **March** | 55 | 130 |
| **April** | 140 | 265 |
| **May** | 45 | 80 |
| **June** | 40 | 80 |
| **July** | 35 | 65 |
| **August** | 40 | 65 |
| **September** | 29 | 65 |
| **October** | 45 | 80 |
| **November** | 60 | 145 |
| **December** | 65 | 90 |

## VII. Antidegradation Evaluation

As set out in *The Basic Standards and Methodologies for Surface Water*, Section 31.8(2)(b), an antidegradation analysis is required except in cases where the receiving water is designated as "Use Protected." Note that "Use Protected" waters are waters "that the Commission has determined do not warrant the special protection provided by the outstanding waters designation or the antidegradation review process" as set out in Section 31.8(2)(b). The antidegradation section of the regulation became effective in December 2000, and therefore antidegradation considerations are applicable to this WQA analysis.

According to the *Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins*, stream segment COGUNF03 is undesignated. Thus, an antidegradation review is required for this segment if new or increased impacts are found to occur.

**Introduction to the Antidegradation Process**

The antidegradation process conducted as part of this water quality assessment is designed to determine if an antidegradation review is necessary and if necessary, to complete the required calculations to determine the limits that can be selected as the antidegradation-based effluent limit (ADBEL), absent further analyses that must be conducted by the facility.

As outlined in the *Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance* (AD Guidance), the first consideration of an antidegradation evaluation is to determine if new or increased impacts are expected to occur.

This is determined by a comparison of the newly calculated WQBELs verses the existing permit limitations in place as of September 30, 2000, and is described in more detail in the analysis. Note that the AD Guidance refers to the permit limitations as of September 30, 2000 as the existing limits.

If a new or increased impact is found to occur, then the next step of the antidegradation process is to go through the significance determination tests. These tests include: 1) bioaccumulative toxic pollutant test; 2) temporary impacts test; 3) dilution test (100:1 dilution at low flow) and; 4) a concentration test.

As the determination of new or increased impacts and the bioaccumulative and concentration significance determination tests require more extensive calculations, the Division will begin the antidegradation evaluation with the dilution and temporary impact significance determination tests. These two significance tests may exempt a facility from further AD review without the additional calculations.

Note that the antidegradation requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. The appropriate standards are used in the following antidegradation analysis.

**Significance Tests for Temporary Impacts and Dilution**

This is not a temporary discharge and therefore exclusion based on a temporary discharge cannot be granted and the AD evaluation must continue.

The ratio of the chronic (30E3) low flow to the design flow is 10:1, and is less than the 100:1 significance criteria. Therefore this facility is not exempt from an AD evaluation based on the dilution significance determination test, and the AD evaluation must continue.

For the determination of a new or increased impact and for the remaining significance determination tests, additional calculations are necessary. Therefore, at this point in the antidegradation evaluation, the Division will go back to the new or increased impacts test. If there is a new or increased impact, the last two significance tests will be evaluated.

**New or Increased Impact and Non Impact Limitations (NILs)**

To determine if there is a new or increased impact to the receiving water, a comparison of the new WQBEL concentrations and loadings verses the concentrations and loadings as of September 30, 2000, needs to occur. If either the new concentration or loading is greater than the September 2000 concentration or loading, then a new or increased impact is determined. If this is a new facility (commencement of discharge after September 30, 2000) it is automatically considered a new or increased impact.

Note that the AD Guidance document includes a step in the New or Increased Impact Test that calculates the Non-Impact Limit (NIL). The permittee may choose to retain a NIL if certain conditions are met, and therefore the AD evaluation for that parameter would be complete.

As the NIL is typically greater than the antidegradation based average concentration (ADBAC), and is therefore the chosen limit, the Division will typically conclude the AD evaluation after determining the NIL. Where the NILs are very stringent, or upon request of a permittee, the Division will calculate both the NIL and the AD limitation so that the limitations can be compared and the permittee can determine which of the two limits they would prefer, one which does not allow any increased impact (NIL), or the other which allows an insignificant impact (AD limit).

The NIL is defined as the limit which results in no increased water quality impact (no increase in load or limit over the September 2000 load or limit). The NIL is calculated as the September 2000 loading, divided by the new design flow, and divided by a conversion factor of 8.34. If there is no change in design flow, then the NIL is equal to the September 2000 permit limitation.

If the facility was in place, but did not have a limitation for a particular parameter in the September 2000 permit, the Division may substitute an implicit limitation. Consistent with the First Update to the AD Guidance of April 2002, an implicit limit is determined based on the approach that specifies that the implicit limit is the maximum concentration of the effluent from October 1998 to September 2000, if such data is available. If this data is unavailable, the Division may substitute more recent representative data, if appropriate, on a case by case basis. Note that if there is a change in design flow, the implicit limit/loading is subject to recalculation based on the new design flow. For parameters that are undisclosed by the permittee, and unknown to the Division to be present, an implicit limitation may not be recognized.

This facility was in place as a discharger prior to September 30, 2000, and therefore the new or increased impacts test must be conducted. As the design flow of this facility has changed, the equations for the NIL calculations are shown below.

**Existing Limits**

The Paonia WWTF was discharging as of September 30, 2000 from a previous facility located just upstream of its present location under CDPS permit number CO0021709. The facility had existing limits for TRC, fecal coliform and total ammonia (July, August, September, October; report only remaining months).

**Implicit Limits**

An implicit limit for T.I.N. is difficult to determine due to lack of effluent data available; therefore, the Division will include monitoring requirements in the permit so that data can be collected in order to make such a determination of an implicit limit.

In accordance with the Division's practice regarding *E. coli*, an implicit limit for *E. coli* is determined as 0.32 times the permit limit for fecal coliform.

The total ammonia "Report" months were based on ammonia assimilative capacities capped at greater than 45 mg/L; therefore, a value of 45 mg/L was used as an implicit limit. Although included as a month of "Report", the month of April had an actual total ammonia value calculated at 39 mg/L, thus this value was used as the implicit limit for April.

**Calculation of Loadings for New or Increased Impact Test**

The equations for the loading calculations are given below. Note that the AD requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the AD review; however, where there is only an acute standard, the acute standard should be used. Thus, the chronic low flows will be used later in this AD evaluation for all parameters with a chronic standard, and the acute low flows will be used for those parameters with only an acute standard.

$$\text{Previous permit load} = M_{permitted}\,(mg/l) \times Q_{permitted}\,(mgd) \times 8.34$$
$$\text{New WQBELs load} = M_2\,(mg/l) \times Q_2\,(mgd) \times 8.34$$

Where,

$M_{permitted}$ = September 2000 permit limit (or implicit limit) **(mg/l)**
$Q_{permitted}$ = design flow as of September 2000 **(mgd)**
$Q_2$ = current design flow (same as used in the WQBEL calculations)
$M_2$ = new WQBEL concentration **(mg/l)**
*8.34* = unit conversion factor

Table A-10 shows the results of these calculations and the determination of a new or increased impact.

**Calculation of Non-Impact Limitations**

The design flow of this facility as of September 30, 2000 was 0.45 MGD. The new design flow of this facility is 0.495 MGD. To determine if new or increased impacts are to occur, the September 2000 permit concentrations need to be adjusted for this new design flow. The equations are shown below.

$$\text{September 2000 permit load} = M_{permitted} \times Q_{permitted} \times 8.34$$
$$\text{Non Impact Limit (NIL)} = \text{September 2000 permitted load} \div \text{New Design Flow} \div 8.34$$

Where,

$M_{permitted}$ = September 2000 permit limit or implicit limit **(mg/l)**
$Q_{permitted}$ = September 2000 design flow **(mgd)**
$Q_2$ = new or current design flow **(mgd)**
*8.34* = Unit conversion factor

Table A-9 shows the results of these calculations and the determination of a new or increased impact.

**Table A-9**

**Determination of New or Increased Impacts**

| *Pollutant* | *Sept 2000 Permit Limit* | *Sept 2000 Permit Load (lbs/day)* | *NIL* | *New WQBEL* | *New WQBEL Load (lbs/day)* | *New or Increased Impact* |
|---|---|---|---|---|---|---|
| *E. coli* (#/100 ml) Apr - Sep | 1920 | 7206 | 1736 | 1043 | 4330 | No |
| *E. coli* (#/100 ml) Oct - Mar | 1920 | 7206 | 1736 | 1926 | 7995 | Yes |
| TRC (mg/l) | 0.016 | 0.06 | 0.015 | 0.12 | 0.5 | Yes |
| Total Inorganic Nitrogen (mg/l) | NA | NA | NA | 74 | 305 | Yes |
| $NH_3$, Tot (mg/l) Jan | 45 | 169 | 41 | 26 | 107 | No |
| $NH_3$, Tot (mg/l) Feb | 45 | 169 | 41 | 26 | 107 | No |
| $NH_3$, Tot (mg/l) Mar | 45 | 169 | 41 | 23 | 95 | No |
| $NH_3$, Tot (mg/l) Apr | 39 | 146 | 35 | 40 | 165 | Yes |
| $NH_3$, Tot (mg/l) May | 45 | 169 | 41 | 19 | 78 | No |
| $NH_3$, Tot (mg/l) Jun | 21 | 79 | 19 | 15 | 62 | No |
| $NH_3$, Tot (mg/l) Jul | 2.5 | 9.4 | 2.3 | 13 | 54 | Yes |
| $NH_3$, Tot (mg/l) Aug | 3.2 | 12 | 2.9 | 14 | 58 | Yes |
| $NH_3$, Tot (mg/l) Sep | 6.9 | 26 | 6.3 | 14 | 58 | Yes |
| $NH_3$, Tot (mg/l) Oct | 5 | 19 | 4.5 | 16 | 66 | Yes |
| $NH_3$, Tot (mg/l) Nov | 45 | 169 | 41 | 25 | 103 | No |
| $NH_3$, Tot (mg/l) Dec | 45 | 169 | 41 | 26 | 107 | No |
| Se, Dis (µg/l) | NA | NA | NA | 42 | 0.17 | NA* |

Note that loading for *E. coli* cannot be calculated; but, for comparison purposes, the approach is sufficient.
*Se included since WLA in TMDL for Paonia of 0.17 lbs/day

As shown in Table A-9, there are no new or increased impacts to the receiving stream based on the new WQBELS for *E.coli* (April through September), and for total ammonia during the months of November to March; and May to June and for these parameters the AD evaluation is complete and the WQBELs are the final result of this WQA.

For TRC, *E.coli* (October through March) and total ammonia during the remaining months there are new or increased impacts and in accordance with the AD Guidance, the permittee has the option of choosing either the NIL's or ADBAC's. Because the ADBAC's are generally more stringent than NIL's, the Division assumes that the permittee will choose NIL's rather than ADBAC's, and therefore the Division will stop the AD evaluation at this point and assign the NILs to the permit. For those parameters where there is not a NIL (either implicit or explicit) the AD Guidance allows for the collection of data to determine an implicit limitation. Therefore, the permittee will be required to conduct "monitoring only" for those parameters. The permittee may request ADBAC limits. If the permittee does request ADBAC limits, the Division will proceed with the completion of this Antidegradation Analysis.

Note that the AD requirements outlined in *The Basic Standards and Methodologies for Surface Water* specify that chronic numeric standards should be used in the antidegradation review; however, where there is only an acute standard, the acute standard should be used. Chronic standards were available for all pollutants except T.I.N.

**Antidegradation Based Effluent Limitations (ADBELs)**

The ADBEL is defined as the potential limitation resulting from the AD evaluation, and may be either the ADBAC, the NIL, may be based on the concentration associated with the threshold load (TL) concentration (for the bioaccumulative toxic pollutants) or another value resulting from the analysis. NILs have already been determined in the AD evaluation, and therefore to complete the evaluation, a final comparison of limitations needs to be completed.

Note that ADBACs and NILs are not applicable when the new WQBEL concentration (and loading as evaluated in the New and Increased Impacts Test) is less than the NIL concentration (and loading), or when the new WQBEL is less than the ADBAC.

Where an ADBAC or NIL applies, the permittee has the final choice between the two limitations. A NIL is applied as a 30-day average (and the acute WQBEL would also apply where applicable) while the ADBAC would be applied as a 2 year rolling average concentration. For the purposes of this WQA, the Division has made an attempt to determine whether the NIL or WQBEL will apply. The end results of this AD evaluation are in Table A-10, including any parameter that was previously exempted from further AD evaluation, with the final potential limitation identified (NIL or WQBEL).

The NILs for total ammonia during the summer months are quite restrictive. In the previous permit cycle ADBACs were calculated but neither the NILs nor the ADBACs were acceptable to the Town of Paonia. In accordance with the AD Guidance, the Town of Paonia then completed an Antidegradation Alternatives Analysis (AA) in 2002 with recommended ADBELs for total ammonia based on best achievable treatment technology. The Division issued a Necessity of Degradation Determination in 2003 which included the Paonia ADBELs which were lower than the 2001 WQBELs but higher than the calculated ADBACs.

For this permit cycle, the previously agreed upon total ammonia ADBELs are higher than the new WQBELs for several months of the year; therefore, continuation of those ADBELs in the new permit would not be protective of water quality. The ADBELs previously determined for the summer months of 9.5 mg/L total ammonia are still lower than the new WQBELs and still higher than the NILs for those months. The Division will continue to include the summer month ADBELs for total ammonia of 9.5 mg/L as they are not only protective of current water quality but in addition protective of remaining assimilative capacity of the North Fork of the Gunnison River. The Division will also grant the ADBEL of 9.5 mg/L for the month of October.

**Table A-10**

**Final Selection of WQBELs, NILs, and ADBELs at Design Flow**

| *Pollutant* | *NIL* | *New WQBEL* | *Chosen Limit* |
|---|---|---|---|
| *E. coli* (#/100 ml) Apr - Sep | 1736 | 1043 | WQBEL |
| *E. coli* (#/100 ml) Oct - Mar | 1736 | 1926 | NIL |
| TRC (mg/l) | 0.015 | 0.12 | NIL |
| Total Inorganic Nitrogen (mg/l) | NA | 73 | WQBEL |
| NH3 as N, Tot (mg/l) Jan | 41 | 26 | WQBEL |
| NH3 as N, Tot (mg/l) Feb | 41 | 26 | WQBEL |
| NH3 as N, Tot (mg/l) Mar | 41 | 23 | WQBEL |
| NH3 as N, Tot (mg/l) Apr | 35 | 40 | NIL |
| NH3 as N, Tot (mg/l) May | 41 | 19 | WQBEL |
| NH3 as N, Tot (mg/l) Jun | 19 | 15 | WQBEL |
| NH3 as N, Tot (mg/l) Jul | 2.3 | 13 | WQBEL, 9.5 mg/L ADBEL |
| NH3 as N, Tot (mg/l) Aug | 2.9 | 14 | WQBEL, 9.5 mg/L ADBEL |
| NH3 as N, Tot (mg/l) Sep | 6.3 | 14 | WQBEL, 9.5 mg/L ADBEL |
| NH3 as N, Tot (mg/l) Oct | 4.5 | 16 | WQBEL, 9.5 mg/L ADBEL |
| NH3 as N, Tot (mg/l) Nov | 41 | 25 | WQBEL |
| NH3 as N, Tot (mg/l) Dec | 41 | 26 | WQBEL |
| Se, Dis (µg/l) | NA | 42 | TMDL based 42 µg/L |

For the following parameters, *E.coli*, TRC, and Total Ammonia (April) the NILs have been established for this facility. The NILs were selected as they are less stringent than the ADBACs. However, the facility has the final choice between the NILs and ADBACs, and if the ADBAC is preferred to be calculated, the permit writer should be contacted.

The NILs for the different flow tiers were as follows:
*E. coli (#/100ml)* – Outfalls 001C = 1736; 001B = 2881; 001A = 4312.
TRC (mg/L) - Outfalls 001C = 0.015; 001B = 0.024; 001A = 0.036.
Ammonia (April mg/L) - Outfalls 001C = 35; 001B = 59; 001A = 88.

For the months of July through October, the WQBEL will be implemented as a chronic 30-day limit along with the ADBEL implemented as a 2-year rolling average limit.

**Alternatives Analysis**

If the permittee does not want to accept an effluent limitation that results in no increased impact (NIL) or in insignificant degradation (ADBAC), the applicant may conduct an alternatives analysis (AA). The AA examines alternatives that may result in no degradation or less degradation, and are economically, environmentally, and technologically reasonable.

If the proposed activity is determined to be important economic or social development, a determination shall be made whether the degradation that would result from such regulated activity is necessary to accommodate that development. The result of an AA may be an alternate limitation between the ADBEL and the WQBEL, and therefore the ADBAC would not be applied. This option can be further explored with the Division. See Regulation 31.8 (3)(d), and the Antidegradation Guidance for more information regarding an alternatives analysis.

The Town of Paonia completed an Antidegradation Alternatives Analysis in 2002 with recommended ADBELs for total ammonia. The Division issued a Necessity of Degradation Determination in 2003 which included the Paonia ADBELs which were lower than the 2001 WQBELs but higher than the calculated ADBACs. The total ammonia ADBELs for the months of October through March were determined in 2003 to be 28 mg/l; April and May 22 mg/l; and June through September of 9.5 mg/l. The Division is continuing to recognize ADBELs for July through October which are less than the WQBELs but greater than the ADBACs. These will be reevaluated during the next permit renewal.

# VIII. Technology Based Limitations

**Federal Effluent Limitation Guidelines**

The Federal Effluent Limitation Guidelines for domestic wastewater treatment facilities are the secondary treatment standards. These standards have been adopted into, and are applied out of, Regulation 62, the Regulations for Effluent Limitations.

**Regulations for Effluent Limitations**

Regulation No. 62, the Regulations for Effluent Limitations, includes effluent limitations that apply to all discharges of wastewater to State waters, with the exception of storm water and agricultural return flows. These regulations are applicable to the discharge from the proposed discharge.

In addition the *WQCD Policy Concerning Escherichia coli versus Fecal Coliform Effluent Limitation*, dated January 12, 2007 provides technology based limits for *E.coli* of 2000/100ml chronic and 4000/100ml acute.

Table A-12 contains a summary of the applicable limitations for pollutants of concern at this facility.

**Table A-12**

**Regulation 62 Based Limitations**

| *Parameter* | *30-Day Average* | *7-Day Average* | *Instantaneous Maximum* |
|---|---|---|---|
| $BOD_5$ | 30 mg/l | 45 mg/l | NA |
| $BOD_5$ Percent Removal | 85%* | NA | NA |
| TSS, aerated lagoon | 75 mg/l | 110 mg/l | NA |
| TSS Percent Removal | 85% | NA | NA |
| Total Residual Chlorine | NA | NA | 0.5 mg/l |
| pH | NA | NA | 6.0-9.0 s.u. |
| Oil and Grease | NA | NA | 10 mg/l |

*The Town of Paonia requested a continuance of the waiver from the 85% BOD removal requirement as part of their permit renewal application. The Town has extensive Infiltration and Inflow (I/I) issues which they continue to address on an ongoing basis.

# IX. References

**Regulations:**

*The Basic Standards and Methodologies for Surface Water, Regulation 31*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective January 31, 2013.

*Classifications and Numeric Standards for Gunnison and Lower Dolores River Basins, Regulation No. 35*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 1, 2013.

*Regulations for Effluent Limitations, Regulation 62*, CDPHE, WQCC, July 30, 2012.

*Colorado's Section 303(d) List of Impaired Waters and Monitoring and Evaluation List, Regulation 93*, Colorado Department Public Health and Environment, Water Quality Control Commission, effective March 30, 2012.

*Colorado River Salinity Standards, Regulation 39, CDPHE, WQCC (last update effective 8/30/97).*

**Policy and Guidance Documents:**

*Antidegradation Significance Determination for New or Increased Water Quality Impacts, Procedural Guidance*, Colorado Department Public Health and Environment, Water Quality Control Division, December 2001.

*Memorandum Re: First Update to (Antidegradation) Guidance Version 1.0*, Colorado Department Public Health and Environment, Water Quality Control Division, April 23, 2002.

*Rationale for Classifications, Standards and Designations of Segments of the Gunnison River*, Colorado Department Public Health and Environment, Water Quality Control Division, effective June 13, 2012.

*Colorado Mixing Zone Implementation Guidance*, Colorado Department Public Health and Environment, Water Quality Control Division, effective April 2002.

*WQCD Policy Concerning Escherichia coli versus Fecal Coliform Effluent Limitation*, Colorado Department Public Health and Environment, Water Quality Control Division, effective January 12, 2007.

*Policy for Conducting Assessments for Implementation of Temperature Standards in Discharge Permits*, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-23, effective July 3, 2008.

*Implementing Narrative Standards in Discharge Permits for the Protection of Irrigated Crops*, Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-24, effective March 10, 2008.

*Policy for Characterizing Ambient Water Quality for Use in Determining Water Quality Standards Based Effluent Limits,* Colorado Department Public Health and Environment, Water Quality Control Division Policy Number WQP-19, effective May 2002.

**Other:**

*Total Maximum Daily Load Assessment, Gunnison River and Tributaries, Uncompahgre River and Tributaries, Delta/Mesa/Montrose Counties, Colorado,* Colorado Department of Public Health and Environment, Water Quality Control Division, January, 2011

*Town of Paonia Wastewater Treatment Plant Discharge Permit-Colorado Mixing Zone Analysis*, letter from C. Kellie Knowles, P.E. of Westwater Engineering to Town of Paonia Public Works Director Scott Leon, dated October 3, 2008.

*Technical Memorandum Re: Paonia Wastewater Treatment Plant Estimated Ammonia Effluent Limits at Design Capacity*, from C. Kellie Knowles, P.E. of Westwater Engineering to Dave Akers CDPHE (and others) dated November 11, 2002. (Town of Paonia Antidegradation Alternatives Analysis)

*Necessity of Degradation Determination Town of Paonia*, Colorado Department Public Health and Environment, Water Quality Control Division, Dave Akers, dated September 30, 2002 revised January 23, 2003.

*Continuance of the Variance from 85% Removal BOD Requirement in Permit No. CO-0021709*, letter from Gary Beers, Colorado Department of Public Health and Environment, Water Quality Control Division, Permits Unit to C. Kellie Knowles, P.E. of Westwater Engineering, dated April 27, 2005.